WHAT IS CLAIMED IS:

1. A method for inspecting an exposure apparatus, comprising:

a step of guiding light emitted from an illumination optical system to a photomask where a pattern is formed of an optical member including a light transmission pattern as a diffraction grating pattern, in which a light transmission part and a opaque part are repeated in a predetermined direction, a plurality of ratios are given between a length of the light transmission part and a length of the opaque part in a repetition direction, and a periphery of the light transmission pattern is shielded by a opaque area, such that a plurality of ratios are given between the light transmission part and the opaque part;

a step of irradiating diffraction light, which has passed through the photomask, on a projection optical system, thereby to transfer a pattern reflecting an intensity distribution of the diffraction light to a wafer; and

a step of measuring a change of transmittance depending on a light path of the projection optical system, based on a pattern image of the diffraction light transferred to the wafer.

2. A method according to claim 1, wherein said pattern transfer is performed in which the photomask and the wafer are non-conjugate with respect to the

projection optical system.

3. A method according to claim 1, wherein, where NA is a numerical aperture of the projection optical system in a side of the wafer, λ is a exposure length, σ is a coherence factor, and M is a magnification of the photomask, the diffraction grating pattern has a period which satisfies

$p>M\lambda/NA(1+\sigma)$

4. A method according to claim 1, wherein the non-conjugate state in which the photomask and the wafer are non-conjugate with respect to the projection optical system is realized by arranging the opaque part of the light optical member on a surface opposite to a surface where the optical member of the photomask used for device pattern exposure is arranged.

5. A method according to claim 1, wherein, where a length of a longest line among lengths of lines connecting arbitrary two points positioned on a boundary to the opaque part, of the opaque part of the light transmission pattern, is 2r, a thickness of the photomask is d, an exposure wavelength is λ, and a refractive index of a material of the photomask at the exposure wavelength λ is n, a relationship of $0.4(nd\lambda)^{1/2} \leqq r \leqq (nd\lambda)^{1/2}$ is satisfied.

6. A method according to claim 5, wherein the light transmission pattern is a circular pattern having a radius r.

7. A method according to claim 6, wherein where, of the light pattern, an area surrounded by the opaque area is expressed πr^2, a thickness of the photomask is d, an exposure wavelength is λ, and a material of the photomask has a refractive index of n, a relationship of $0.4(nd\lambda)^{1/2} \leqq r \leqq 10(nd\lambda)^{1/2}$ is satisfied.

8. A method according to claim 1, wherein

the pattern formed on the wafer is made of a predetermined material, and

the change of the transmittance is measured by measuring a film thickness of the pattern transferred to the wafer and by obtaining a light intensity of the diffraction light, based on a predetermined relationship between a film thickness of the predetermined material and an irradiation light intensity.

9. A method according to claim 1, wherein the predetermined relationship between the film thickness of the predetermined material and the light intensity is a sensitivity curve expressing the relationship between the film thickness of the predetermined material and the light intensity.

10. A method according to claim 1, wherein a change of the transmittance is measured in a manner that a boundary between an area where photoresist was stripped and an area where photoresist was remained is regarded as a equal-intensity contour curve, a plurality of equal-intensity contour curves each being

the equal-intensity contour curve are obtained respectively under different conditions, and the plurality of equal-intensity contour curves obtained are layered thereby to obtain an equal-intensity contour plot.

11. A method for inspecting an exposure device, comprising:

a step of guiding light emitted from an illumination optical system to a photomask where a pattern is formed of an optical member including a light transmission pattern as a diffraction grating pattern, in which a light transmission part and a opaque part are repeated in a predetermined direction, a plurality of ratios are given between a length of the light transmission part and a length of the opaque part in a repetition direction, phases of lights which pass through adjacent light transmission parts with the opaque part inserted therebetween differs from each other substantially by 180°, and a periphery of the light transmission pattern is shielded by a opaque area, such that a plurality of ratios are given between the light transmission part and the opaque part;

a step of irradiating diffraction light, which has passed through the photomask, onto a projection optical system, thereby to transfer the pattern to a wafer and to form a pattern reflecting an intensity distribution of the diffraction light; and

a step of measuring a change of transmittance depending on a light path of the projection optical system, based on a pattern image of the diffraction light transferred to the wafer.

12. A method according to claim 11, wherein said pattern transfer is performed in which the photomask and the wafer are non-conjugate with respect to the projection optical system.

13. A method according to claim 11, wherein

the pattern formed on the wafer is made of a predetermined material, and

the change of the transmittance is measured by measuring a film thickness of the pattern transferred to the wafer and by obtaining a light intensity of the diffraction light, based on a predetermined relationship between a film thickness of the predetermined material and an irradiation light intensity.

14. A method according to claim 11, wherein the predetermined relationship between the film thickness of the predetermined material and the light intensity is a sensitivity curve expressing the relationship between the film thickness of the predetermined material and the light intensity.

15. A method according to claim 11, wherein a change of the transmittance is measured in a manner that a boundary between an area where photoresist was stripped and an area where photoresist was remained

is regarded as a equal-intensity contour curve, a plurality of equal-intensity contour curves each being the equal-intensity contour curve are obtained respectively under different conditions, and the plurality of equal-intensity contour curves obtained are layered thereby to obtain an equal-intensity contour plot.

16. A method for inspecting an exposure device, comprising:

a step of guiding light emitted from an illumination optical system to a photomask where a pattern is formed of an optical member including a light transmission pattern as a diffraction grating pattern, in which a first light transmission part and a second light transmission part having a lower transmittance than the first light transmission part are repeated in a predetermined direction, a plurality of ratios are given between lengths of the first and second light transmission parts in a repetition direction, phases of lights which pass through the first and second light transmission parts adjacent to each other differ from each other, and a periphery of the light transmission pattern is shielded by a opaque area, such that a plurality of ratios are given between the light transmission part and the opaque part;

a step of irradiating diffraction light, which has passed through the photomask, onto a projection optical

system, thereby to transfer the pattern to a wafer and to form a pattern reflecting an intensity distribution of the diffraction light; and

a step of measuring a change of transmittance depending on a light path of the projection optical system, based on a pattern image of the diffraction light transferred to the wafer.

17. A method according to claim 16, wherein said pattern transfer is performed in which the photomask and the wafer are non-conjugate with respect to the projection optical system.

18. A method according to claim 16, wherein

the pattern formed on the wafer is made of a predetermined material, and

the change of the transmittance is measured by measuring a film thickness of the pattern transferred to the wafer and by obtaining a light intensity of the diffraction light, based on a predetermined relationship between a film thickness of the predetermined material and an irradiation light intensity.

19. A method according to claim 16, wherein the predetermined relationship between the film thickness of the predetermined material and the light intensity is a sensitivity curve expressing the relationship between the film thickness of the predetermined material and the light intensity.

20. A method according to claim 16, wherein

a change of the transmittance is measured in a manner that a boundary between an area where photoresist was stripped and an area where photoresist was remained is regarded as a equal-intensity contour curve, a plurality of equal-intensity contour curves each being the equal-intensity contour curve are obtained respectively under different conditions, and the plurality of equal-intensity contour curves obtained are layered thereby to obtain an equal-intensity contour plot.